CLAIMS

1. A method for producing power from combustion of a fuel which comprises:
    a. feeding a pressurized Oxygen-containing gas and then a combustible fuel to a first combustion zone of constant volume to form a combustible mixture therein combusting said combustible mixture in said first combustion zone under substantially adiabatic conditions to form gaseous combustion products and exhausting said gaseous combustion products from said first combustion zone at a first predetermined range of elevated temperature and pressure in a first cycle;
    b. feeding a pressurized Oxygen-containing gas and then a combustible fuel to a second combustion zone of constant volume process to form a combustible mixture therein combusting said gaseous mixture in said second combustion zone under substantially adiabatic conditions to form gaseous combustion products and exhausting said gaseous combustion products from said second combustion zone at a first predetermined range of elevated temperature and pressure in a second cycle;
    c. feeding said exhausted combustion gaseous products from each of said combustion zones to a work-producing zone and expanding said gases in said work-producing zone whereby work is generated by said expansion; and
    d. alternately repeating said first and second cycles, each of said cycles being operated to provide a substantially continuous stream of said exhausted gaseous combustion products sequentially from said first and second combustion zones to said work producing zone.

2. The method of claim 1, including forming in a mixing zone an admixture of said exhausted combustion gases and a secondary gas at a second predetermined range of temperature and pressure lower than said first predetermined range, said mixing zone being between said combustion zones and said work-producing zone, and said admixture is fed to said work producing zone

3. The method of claim 2, wherein said secondary gas is ambient air.

4. The method of claim 2, wherein said secondary gas is provided by recovering at least a portion of said expanded gases and recycling said portion to said admixing zone.

5. The method of claim 1, wherein three or more combustion zones are provided.

6. The method of claim 1, wherein a flame is propagated in each said combustion zone and water is introduced into each said combustion zone to cool said flame and reduce the temperature and increase the weight of said gaseous combustion products.

7. Apparatus for producing power from combustion of fuel, which comprises:

   a. a plurality of gas reactors, each said gas reactor having an elongated sealed housing of constant volume, inlets and outlets at opposite ends thereof, means for thermally insulating said housing and means for propagating a modulated flame within said housing;

   b. first conduit means communicating with said inlets for feeding a pressurized Oxygen-containing gas and then a combustible fuel to the interior of each of said reactors to form a combustible mixture therein;

   c. second conduit means communicating with said outlets for exhausting gaseous combustion products from said reactors;

   d. means for producing work by expansion of gases, said work-producing means having inlets and outlets and third conduit means providing fluid communication between said gas reactors outlets and said work-producing means inlets; and

   e. first control means for operating said gas reactors to provide substantially continuous flow of exhausted gaseous combustion products to said work producing means alternately and sequentially from said gas reactors;

8. The apparatus of claim 7, including mixing means for admixing a secondary gas with said combustion products to form an admixture of gases at a second predetermined range of temperature and pressure lower than said first predetermined range, said mixing means being between said gas reactors and said work-producing means, and means for feeding said admixture to said work-producing means.

9. The apparatus of claim 8,wherein said secondary gas is ambient air.

10 The apparatus of claim 8,wherein means are provided to recover

at least a portion of said expanded gases and to feed said recovered portion as said secondary gas to said mixing means.

11. The apparatus of claim 8, comprising means for introducing water into said gas reactors to cool a flame therein, means for recovering at least a portion of gases exhausted from said work-producing means as said secondary gas, and means for cooling said secondary gas by expansion to condense at least part of water in said secondary gas, dryer means for removing condensed water from said secondary gas, and means for feeding dried secondary gas to said mixing means.

12. The apparatus of claim 7, wherein each of said gas reactors has opposed first and second ends, a centrally placed elongated flame retaining chamber within said housing between said ends and in communication with said gas reactor inlets, said flame retaining chamber having a flame regulation structure comprising combustion air inlets and fuel outflow nozzles, each of relatively large cross-sectional area and arranged symmetrically with respect to the longitudinal axis of said chamber to provide symmetrical flame propagation longitudinally into said flame retaining chamber, said flame retaining chamber having a diverging portion adjacent said first end and adjacent to the flame with substantial perforations for easy passage of local circulating products of combustion from an annulus space between the inner wall of said housing and the outer surface of said flame retaining chamber, while just downstream of the flame said flame retaining chamber converges and terminates in an ejection nozzle, whereby said gaseous products of combustion strike said second end of said reactor and whereby by thermal forces said products of combustion are transferred to said first end of said reactor and thence through said perforations in said diverging section of said flame retaining chamber and through said combustion air inlets.

13. The apparatus of claim 7, comprising means to compress air to a predetermined pressure, substantially isothermally, by means of water injection and external cooling and means for feeding said compressed air to said gas reactors inlets.

14 Apparatus of claim 7, wherein said work producing means comprises one or more rotary gas motors arranged in series and/or parallel suitable to load conditions, said gas motors being operated by said admixture of gases at said second predetermined range of temperature and pressure.

15. Apparatus of claim 7, wherein said work-producing means comprises one or more reciprocating gas motors arranged in series and/or parallel suitable to load conditions.

16. The apparatus of claim 14, wherein said gas rotary motors are turbines each having an output shaft, and means are included to provide regulated and automatic controls of said turbines such that the output shaft torque is maximum at zero speed and is lower at higher speeds and suitably matched to self-propelled vehicles operating load characteristics, and wherein such turbines are mechanically coupled in series or parallel to loads in a manner to perform as torque converters such that mechanical power delivery transmissions are not necessary.

17. The apparatus of claim 14, wherein said rotary gas motors have a double acting free piston axially reciprocating in a chamber having a bore and a first end and a second end with shaft extensions for coupling loads and with means to inject and vent said secondary gas with automatic controls for rapid oscillation.

18. Apparatus of claim 8, wherein said rotary gas motors are provided in a self-propelled vehicle to power said vehicle, means for providing an admixture of products of combustion and a lower pressure secondary gas to said rotary gas motors during acceleration of said vehicle, means for providing ambient air to said rotary gas motor during deceleration of said vehicle, and means for storing pressurized ambient air exhausted from said rotary gas motors and for supplying said exhausted pressurized air to said rotary gas motors for subsequent accelerations of said vehicle.

19. The apparatus of claim 7, wherein said combustible mixture comprises air and a combustible fuel, heat-exchanger means for preheating said charged air before said combustible fuel is charged into said gas reactors, a solar-energy concentrator-collector means is provided remote from said gas reactors, and means is provided to transfer collected heat from said solar-energy means to said heat-exchanger means, said gas reactors being located underground.

20. The apparatus of claim 7, including means for computer monitoring and control comprising;

a. means for operating safety and overpressure valves;

b. means for regulating pressures and temperatures;

c. means for observing flame during operation;

d. means for proportioning and diverting flows of gas streams; and

e. means for switching entry and exit ports in said reactor and devices associated with operation of the system.

21. The apparatus of claim 8, wherein said mixing means includes a venturi-type nozzle therein for mixing said higher pressure combustion products with said lower pressure secondary gas with means for tangential secondary gas entry in the perimeter thereof, and said mixing means comprises a hollow cylindrical heat-resistant chamber with sealed ends and interior and exterior insulation.

22 The apparatus of claim 9, wherein said work-producing means is in a heated space, and said feeding means is operable to feed a portion of said admixture to said work-producing means and a portion to said heated space to heat said space.

23 The apparatus of claim 9, wherein said work-producing means is operably connected to and powers an energy consuming device selected from the group consisting of a distributive cooking means, a hot water heating means and a clothes drying means, and said feeding means is operable to feed a portion of said admixture to said work-producing means and a portion to said energy consuming means to provide heat therein.

24. The apparatus of claim 7,wherein said gas motors are located at a plurality of load applications for stationary and portable power plants whereby forming distributive operation of systems.